Floating Wind Turbine Challenge

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Floating Wind Turbine Challenge

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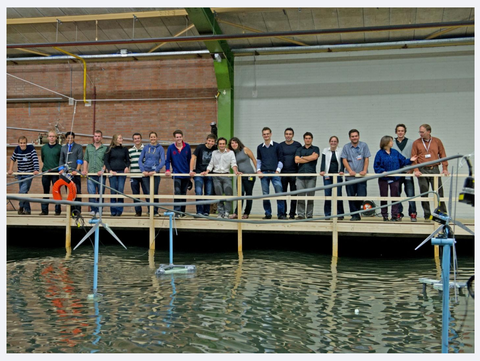
Abstract

The International Network on Offshore Renewable Energy encourages exchange between PhD students, Post Docs, early stage researchers who work with issues related to offshore wind, wave or tidal energy. INORE brings together young researchers from around the world to meet, collaborate and share knowledge on renewable energy. Pushed by the conviction that shipbuilding and offshore knowledge can be applied to new technology in offshore renewable energy, the Maritime Research Institute Netherlands (MARIN) has formed in mid-2009 the Renewable Energy Team (RENT).

On June 23 and 24 2011, 25 international PhD students and young researchers of the international offshore wind industry gathered at the floating wind turbine challenge, organized by MARIN and INORE. At this event 7 teams had to develop a floating structure for a 1/100 scale wind turbine in only 24 hours. The models were then tested in MARIN's Shallow Water Basin as visitors from the OMAE2011 conference looked on. Each team had been provided with the same limited amount of basic materials to build a floater for the wind turbine. The participants designed and built the floater by themselves. The concepts were tested in extreme waves up to 10m full scale, for a duration of more than 2 hours. This challenge is a demonstration that successful team work can lead to working innovative solutions!

24h from scratch to model tests in a basin!

MEET



DESIGN

Pitch natural period

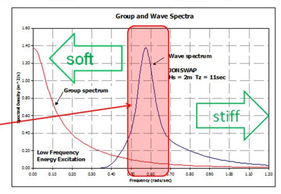
Frequency

$\omega_e = [(C_{55} + K_{55}) / (I_{55} + A_{55})]^{0.5}$ [rad/s]

Period

$T_e = 2\pi / \omega_e$ [s]

Forbidden zone!



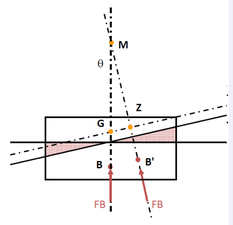
Stability in pitch

$M_{yy}(\theta) = -\rho.g.\Delta.GZ_t$
$-\rho.g.\Delta.GM_t.\sin(\theta)$

$\theta << 1 \rightarrow \sin(\theta) \approx \theta$

$dM_{yy}(\theta)/d\theta = -\rho.g.\Delta.GM_t$

$C_{55} = \rho.g.\Delta.GM_t$



BUILD & INSTALL

TEST

RANK

Conclusions

The wind industry needs talent and innovation to make the step to offshore floating wind turbines. The floating wind turbine challenge was a successful event where 25 international students and researchers of the international offshore wind industry competed in small teams to develop original concepts of floating wind turbines. These teams had less than 24h to bring their concept from the paper to scaled model tests in the wave basin. the 7 prototypes were stable and all of them had survived the full test campaign. As every challenge needs a winner, the organizing team looked at the lower horizontal acceleration at the nacelle and the lowest weight to make a ranking. A spar-buoy and a semi-submersible platform ended up at the first two places.

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